

COUNTLESS swarms of rats periodically make their appearance in the bush country of the South Island, New Zealand. They invariably come in the spring, and apparently periods of about four years intervene between their visits. In a paper published in the new volume of the Transactions and Proceedings of the New Zealand Institute, Mr. Joseph Rutland brings together some interesting notes on the bush rat (*Mus maorium*). In size and general appearance it differs much from the common brown rat. The average weight of full-grown specimens is about 2 ounces. The fur on the upper portions of the body is dark brown, inclining to black; on the lower portions white or greyish-white. The head is shorter, the snout less sharp, and the countenance less fierce than in the brown species. On the open ground bush rats move comparatively slowly, evidently finding much difficulty in surmounting clods and other impediments; hence they are easily taken and destroyed. In running they do not arch the back as much as the brown rat. This awkwardness on the ground is at once exchanged for extreme activity when they climb trees. These they ascend with the nimbleness of flies, running out to the very extremities of the branches with amazing quickness; hence, when pursued, they invariably make for trees if any are within reach. The instinct which impels them to seek safety by leaving the ground is evidently strong. A rat, on being disturbed by a plough, ran for a while before the moving implement, and then up the horse-reins, which were dragging along the ground. Another peculiarity of these animals is that when suddenly startled or pursued they cry out with fear, thus betraying their whereabouts, an indiscretion of which the common rat is never guilty.

In a paper recently read before the Vienna Academy, Herren Elster and Geitel give the results of a year and a half's observations of atmospheric electricity on the north side of Wolfenbüttel (bordering an extensive meadow). They used a stand carrying a petroleum flame and connected by insulated wire with an electroscope. A marked difference was found in the phenomena of spring, summer, and autumn, on the one hand, and winter on the other. In the former the daily variation of the fall of potential showed a distinct maximum between 8 and 9 a.m., as Exner found at St. Gilgen, and a distinct minimum between 5 and 6 p.m., whereas Exner found a maximum about 6. In winter there is great irregularity; but a weak minimum occurs about 11 a.m., and a more decided maximum about 7 p.m. It appears to the authors that other factors than humidity, with which Exner seeks to explain the variations, are concerned in the case. When the temperature goes below zero, cold mist being then generally present, there is often rather a sharp rise in the values, the aqueous vapour having then less action. Rainfall in a neighbouring region lowers the fall of potential both in winter and summer, and a disturbance of the normal course will announce a coming change in places still unclouded. Snow, it seems, rather raises the values. It has been shown by Linss that the course of the fall of potential is inversely as the coefficient of dispersion of the air for electricity; which, again, depends not only on the dust and aqueous vapour present, but also, according to Arrhenius's theory, on a sort of electrolytic or dissociative action of the sun's rays on the atmosphere (thus it has been shown that electricity escapes from a conductor under the influence of ultra-violet rays). The authors find their results support this latter view. They consider that the electric processes during formation of precipitates are the chief cause of the disturbance of the normal condition.

THE additions to the Zoological Society's Gardens during the past week include a Rhesus Monkey (*Macacus rhesus*) from India, presented by Miss White; a Common Fox (*Canis vulpes*), British Isles, presented by Mr. H. Fane Gladwin; a — Fox (*Canis* —) from Buenos Ayres, presented by Mr. J. R. Bell;

NO. 1087, VOL. 42]

a Common Otter (*Lutra vulgaris*), British Isles, presented by Mr. W. Corbet; a Punjab Wild Sheep (*Ovis cycloceros*) from India, presented by Dr. W. King; two European Scops Owls (*Scops gui*) from Austria, presented by Mr. Edward R. Divett; six Prussian Carp (*Carassius vulgaris*), British fresh waters, presented by Mr. G. S. Godden; three Pochards (*Fuligula ferina*), Europe, purchased; a Yak (*Poëphagus grunniens*), a Yellow-footed Rock Kangaroo (*Petrogale xanthopus*), and three Cambayan Turtle-doves (*Turtur senegalensis*), bred in the Gardens.

OUR ASTRONOMICAL COLUMN.

OBJECTS FOR THE SPECTROSCOPE.

Sidereal Time at Greenwich at 10 p.m. on August 28 = 20h. 28m. 16s.

Name.	Mag.	Colour.	R.A. 1890.	Decl. 1890.
			h. m. s.	° ' "
(1) G.C. 4572	—	—	20 17 28	+ 19 45
(2) P Cygni	Var.	Yellow.	20 13 44	+ 37 41
(3) D.M. + 17° 4370 ...	7	Reddish-yellow.	20 33 4	+ 17 53
(4) e Delphini	4	Yellowish-white.	20 28 0	+ 10 36
(5) a Delphini	3.5	White.	20 34 30	+ 15 37
(6) 228 Schj.	7	Reddish-yellow.	19 28 1	— 16 34
(7) X Ophiuchi	Var.	Red.	18 33 7	+ 8 44

Remarks.

(1) This is a fine though small planetary nebula, with four minute stars in close proximity. Lord Rosse described it as "a beautiful little spiral." In 1866 Dr. Huggins observed the spectrum of the nebula, and recorded:—"The spectrum of this nebula consisted of one bright nebulous line of the same refrangibility as the brightest of the lines of nitrogen. No other line was certainly seen." It is evident that this observation has an important bearing on the character of the chief line of the nebula spectrum, and it would be well if some other observer would take the trouble to reobserve it. It should be noted also whether the nebulosity is limited to one side of the line, or is equally visible on both sides.

(2) In 1600, this appeared as a bright star, but it has since been comparatively faint. It is especially interesting from the fact that its spectrum contains bright lines, chief amongst these being the lines of hydrogen and D₃. The Henry Draper Memorial photograph, however, shows in addition a very bright line near λ 447, which Mr. Lockyer suggests, from its association with D₃, is Lorenzoni's *f* of the chromosphere spectrum. It will be remembered that this line occurs also in the spectrum of the Orion nebula. Hence, the lines in the visible part of the spectrum which are common to P Cygni and the Orion nebula are hydrogen (F and G), D₃, and 447 (*f*); another bright line in the violet is also common to the photographs of the two spectra. This similarity is evidently in favour of the view that stars with bright line spectra are similar in constitution to nebulae, though they are probably more condensed. It will be an interesting inquiry to see if P Cygni has anything more in common with nebulae in the visible spectrum.

(3) According to the records of the spectrum of this star, it is one of the finest of Group II. Dunér calls it superb, all the bands 2-9 being extremely wide and dark. It affords a good opportunity for further observations of the peculiarities of this class of spectrum.

(4) Gothard states the spectrum of this star as ? II. *a*, whilst Vogel writes it I. *a* (Group IV.). My own observations confirm Vogel's statement, the spectrum being almost like that of *a* Lyra.

(5) A star of Group IV.

(6) This is a star of Group VI., showing the secondary bands 2, 3, 4, and 5 (all in the red and yellow) in addition to the bands of carbon. The star is not so red as most of the members of the group, and this is no doubt due to the absorption of red light by the secondary bands. Other details should be looked for.

(7) This Group II. star will reach a maximum about September 5, and the appearance of bright lines, as in other variables of the same type, may be expected. The period is about 300 days, and the magnitude changes from 6.8 to 9.

A. FOWLER.

OBSERVATIONS OF SATURN AT THE DISAPPEARANCE OF THE RING.—In a memoir "Sur la variabilité des anneaux de Saturne," published in the *Bulletin Astronomique* (vol. ii. p. 28), M. E. L. Trouvelot touches on some interesting phenomena that he observed in 1877-78, before, during, and after the passage of the sun and earth across the plane of Saturn's rings. On May 18, 1877, M. Trouvelot remarked that the illuminated surface of the ring appeared notably less luminous than the planet; further observations confirmed this, and left no doubt that its relative light diminished up to the passage of the sun across its plane. It was also observed that the colour of the light of the ring appeared yellowish and slightly orange when compared with that of the planet, whereas observations made between 1872-76 indicated that the planet was of a yellowish colour when compared with the ring. The two sets of observations are thus diametrically opposed to each other; and it appears that, when the height of the sun above the plane of the ring is reduced to $4^{\circ} 30'$, the surface of the latter gradually diminishes in light with the approach of the sun to the plane, and afterwards the opposite surface increases in light intensity until the angular distance of the sun from the plane of the ring is again $4^{\circ} 30'$. The cause of this diminution and increase is not well known. It may be due to the change in the angle of incidence of the sun's rays, and, therefore, in the amount of light reflected or to the absorption of the sun's rays by the atmosphere belonging to the rings, or to many other causes.

From October 6, 1877, when the sun was $1^{\circ} 49'$ north of the plane of the rings, to February 6, 1878, when the sun crossed the plane, the illuminated surface gradually decreased in width until it appeared as a thin line difficult to recognize, because of its extreme tenuity. It was observed that the decrease in the width of the illuminated ring appeared to be produced by a shadow slowly obscuring it, and M. Trouvelot attributes the shadow to the existence of a zone elevated above the general level of the ring and slightly inclined towards the planet. To produce the observed phenomenon, a protuberant zone on the ring B, and 6000 kilometres from its outer edge, would have to have an elevation of about 400 kilometres above the plane of the rings: that is, if the north and south surfaces are symmetrical, the thickness of the zone would be 800 kilometres. In consequence, however, of the position of the zone on the ring B, and 25,600 kilometres from the edge of A, the better half of it is generally invisible, hence in practice the thickness may be said to be 400 kilometres, or nearly 249 miles.

Prof. A. Hall has a short note on "The Thickness of Saturn's Ring," in the *Astronomical Journal*, No. 222, and develops the equation by means of which it may be determined. He also notes that Dusejour gives a value equivalent to 958 English miles in his "Traité Analytique," t. ii. p. 127 (Paris, 1789), as the result of a discussion of the disappearances and reappearances of the ring observed before 1789. Herschel, by comparing the thickness of the ring with the apparent diameters of the satellites, found the value 856 miles (Phil. Trans., vol. lxxx. pp. 6 and 7, 1790).

Schroeter found the value of 539 English miles from measurements of the width of the trace of the ring on the ball of the planet ("Kronographische Fragmente," pp. 157 and 211, Göttingen, 1808).

W. C. and G. P. Bond by comparing the amount of light received from the surface of the ring a short time before its disappearance with the light received from the edge of the ring found the value < 43 miles.

With respect to this latter value M. Trouvelot remarks: "Mais Bond, qui ignorait que le système des anneaux de Saturne n'est pas plan, et que c'est à une assez grande distance de son bord extérieur qu'il atteint son maximum d'épaisseur, ne pouvait arriver qu'à une évaluation erronée et trop petite de cette épaisseur."

Several other points are touched upon in M. Trouvelot's memoir, viz. that Cassini's division appeared more visible on the eastern side of the planet than on the western, when the elevation of the sun above the plane of the ring was between $+0^{\circ} 45'$ and $+0^{\circ} 27'$; and that the edge of Saturn, like that of Jupiter, was notably more luminous than other parts of the globe. The difference in outline between the preceding and following parts of the ring, the deformation of the limb of the planet at different dates, and many observations possible during the disappearance of the ring are also considered.

The memoir concludes with some remarks and suggestions on the observations that should be made during 1891-92. The

next disappearance of the ring is on September 22, 1891, and it will reappear on October 30 of the same year. Again, in May 1892, Saturn will be well situated for observations on the structure of the rings causing the shadow noticed in 1877-78. It is to be hoped therefore that the increased powers now at our disposal will enable many of the questions raised by M. Trouvelot to be definitely settled.

OBJECTS HAVING PECULIAR SPECTRA.—In *Astronomische Nachrichten*, No. 2986, Prof. E. C. Pickering, Director of Harvard College Observatory, notes that an examination of photographs taken during March and April 1890, by Mr. S. J. Bailey, near Closica, Peru, has led to the discovery of some interesting spectra.

A photograph of the spectrum of R Carinæ (R.A. 9h. 29^m., Decl. $-62^{\circ} 21'$, 1900) taken on April 4, 1890, shows that the G and $\frac{1}{2}$ lines due to hydrogen are bright, as in Mira Ceti and other variables of long period.

Two photographs taken on March 19 and 20, 1890, of the star, Cordova General Catalogue, No. 15,177, magnitude $8\frac{1}{2}$ (R.A. 11h. 0^m., Decl. $-65^{\circ} 1'$, 1900), show that it has a spectrum consisting mainly of bright lines, and similar to that of Wolf and Rayet's three stars in Cygnus.

The nebula, General Catalogue, No. 2581 (R.A. 11h. 45^m., Decl. $-56^{\circ} 29'$, 1900) has the same spectrum as General Catalogue 4628. Both these objects show bright lines in the ultra-violet portion of their spectra, which have not been discovered in any other planetary nebulae.

D.M. + $30^{\circ} 3699$, magnitude 9.3 (R.A. 19h. 31^m., Decl. $+30^{\circ} 19'$, 1900), is seen to have bright lines in its spectrum on photographs taken at Cambridge with the 8-inch Draper telescope on June 18, 23, and 25, 1890. The spectrum of this star differs from that of other bright-line spectra of which photographs have been obtained.

ON THE CAPTURE OF YOUNG (IMMATURE) FISHES, AND WHAT CONSTITUTES AN IMMATURE FISH.

SINCE steam-trawling became prominent, frequent complaints of the constant and great destruction of very young fishes by this mode of fishing have been made; indeed, besides the injury to the so-called eggs of food-fishes—then said to be deposited on the bottom—no subject attracted more attention in the Royal Commission of 1883-84—presided over by Lord Dalhousie. Recently the subject has again been urged before the National Sea Fisheries Protection Association—especially by the fish-merchants of London (on the alleged grounds of the diminution in size of the valuable food-fishes)—and, with the assistance of the Board of Trade, an International Conference, to discuss remedial measures "to be taken for the preservation and development of the fisheries in the extra-territorial waters of Europe," was convened in the Fishmongers' Hall. It would be a misapprehension, however, to suppose that those who attended the Conference confined their attention to extra-territorial waters, since the inshore ground (within the three-mile limit) is really more important, e.g. in regard to the preservation of certain flat fishes, than the offshore. Thus, as formerly shown, the plaice for the most part passes its early life in the shallow sandy bays of the inshore, and as it attains a length of about fifteen inches it in most cases frequents the deeper water offshore, where it chiefly spawns, the pelagic ova and larvæ being carried shorewards to repeat the process. In the same way multitudes of small turbot, brill, and soles pass their early existence not far from low-water mark on sandy beaches; ling in the barred condition amongst rocks at extreme low-water; and cod, coal-fish, pollack, and whiting, near the same regions. Remedial measures therefore, applied, for instance, to the plaice in extra-territorial waters, could only affect the adult or nearly adult fishes, and mainly in regard to the spawning individuals, a point no doubt of vital importance, but which nevertheless does not touch the question before us, viz. the young or immature fishes.

In most modes of fishing as at present followed, young or immature fishes are captured. Thus, in line-fishing a considerable number are hooked throughout the year, and in certain parts of the east coast many in September and October. When we consider the large number of men engaged in line-fishing, and the almost constant nature of such captures, we cannot conscientiously overlook it. The drain on the young cod, haddock,